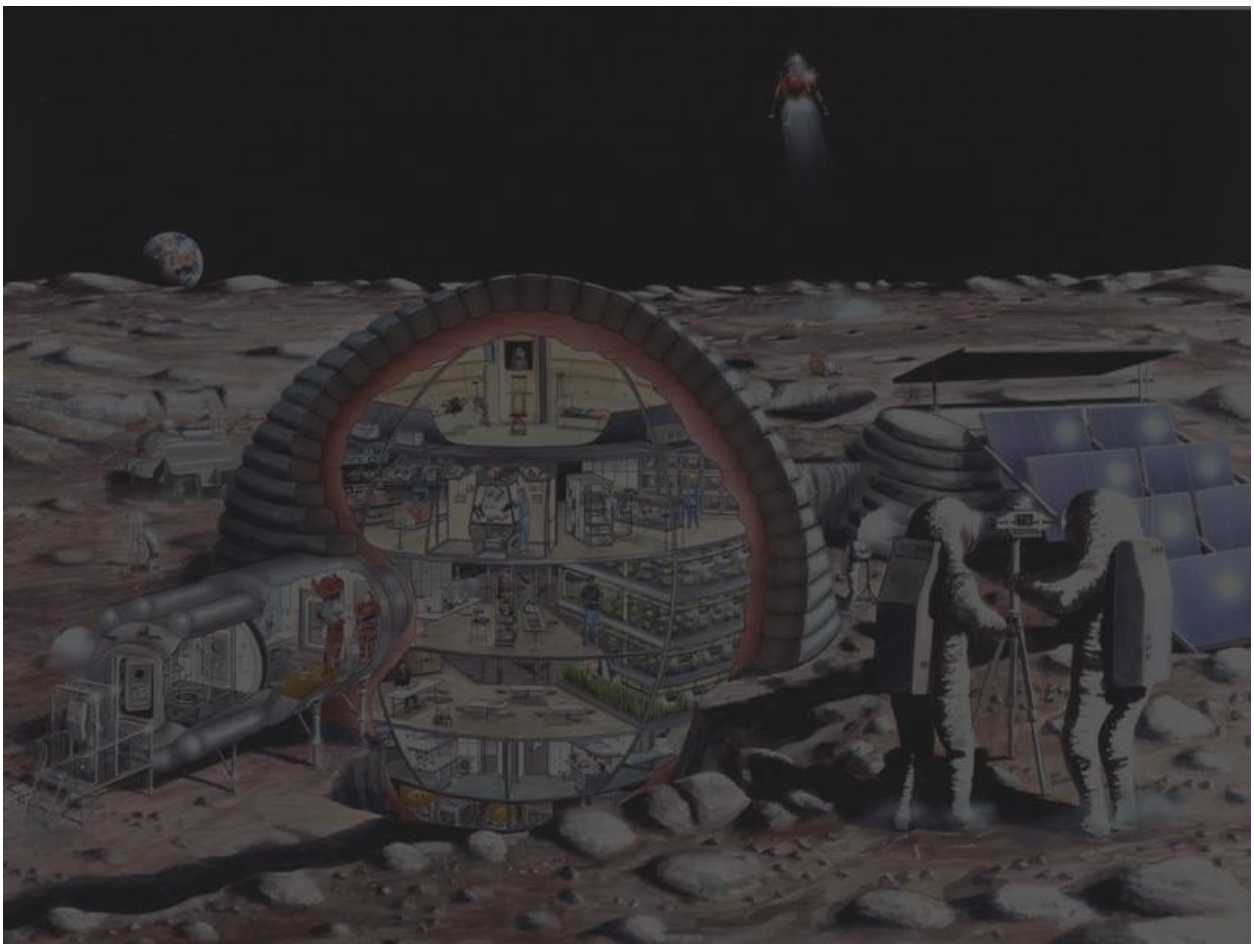
National Aeronautics and Space Administration

Habitats, Managing them in Space

A Digital Learning Network Experience



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Grades	1-5
Subject Areas	Earth Science, Physical Science, Space Colonization, Planetary Exploration

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Digital Learning Network (DLN) Program

A DLN Program is a one-time connection that allows students to experience NASA first-hand. Each expedition features an integrated educational package of grade-appropriate instruction and activities centered around a 30 to 60 minute videoconference. Students will actively learn with a NASA Education Specialist or a NASA Subject Matter Expert.

Habitats, Managing them in Space

Grade Level: Grades K to 5

Focus Question

A habitat can be anywhere or a place where anything resides. Where would you decide to go and what would you have to consider or change to survive in your new habitat?

5-E Learning Objectives

Engage	The learner will discuss how other planets or planetary bodies are different environments than Earth
Explore	The learner will examine various types of habitats of Earth, including the difference from location to location, and how these same principles apply once you leave Earth.
Explain	The learner will identify some of the challenges that may be encountered in trying to make space a habitat and express why they are challenges.
Elaborate	The learner will analyze some of the ways these problems might be solved and possible uses of chosen location resources
Evaluate	The learner will evaluate the benefits and risks involved with putting astronauts or spacecraft away from Earth for long periods of time.

Educational Standards

Next Generation Science Standards

Kindergarten

K-ESS3-1 Earth and Human Activity

Students who demonstrate understanding can:

K-ESS3-1. Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.

Grade 1-2

2-LS4-1 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.

Grade 3

3-LS4-3 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Grade 4

3-LS4-4 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

4-ESS3-1 Earth and Human Activity

Students who demonstrate understanding can:

4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Grade 5

MS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics
Students who demonstrate understanding can: **MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.**

Pre-Conference Activities

Draw a Habitat - Classroom time permitting the students may design a diagram of a Earth Habitat with the supplies, materials, and environmental statistics to support life. During the conference they can make notes of what they would add, change, and /or modify to their design. If they do this activity please have the drawing available during the conference to add some notes for enhancements they would make in their post conference drawing.

Design Rubric – See attached

Before Your Videoconference

Audience Guidelines

Teachers, please review the following points with your students prior to the event:

- A videoconference is a two-way event. Students and NASA presenters can see and hear one another.
- Students are sometimes initially shy about responding to questions during a distance learning session. Explain to the students that this is an interactive medium and we encourage questions.
- Students should speak in a loud, clear voice. If a microphone is placed in a central location instruct the students to walk up and speak into the microphone.
- Teacher(s) should moderate students' questions and answers.

Pre Video Conference Checklist

1. _____ Print a copy of the Educator Guide.
2. _____ Review the pre-activities and resources in the guide.
3. _____ Have students complete the recommended pre-activities found on page 5.
4. _____ Review the Audience Guidelines above.

During and After Your Video Conference

Outline for Videoconference

I. Welcome

II. Introduction

III. Learners will first describe what a habitat is. Are habitats for animals, humans or both? How do you manage a habitat? Participants will describe how they manage their personal habitats. (i.e. do you have your own bed room? How do you manage your bed room? What supplies do you have in your room and why?)

Learners will then be exposed to various other environments on Earth. After learners are shown a picture of an environment on Earth, they will then be asked what their reaction would be if they were told they were moving to this location. Students will then look at a variety of different environments on Earth to evaluate what would be different for each location and determine the supplies they may need to survive in these locations. (Note: these findings could be used to make notes to enhance the pre-conference activity of the habitat they drew if you had time to do this before the event. Use of surroundings and what would be needed to keep the habitat functional and life supporting.)

The environment of space will then be analyzed. What are the differences and the challenges of this environment? Are these challenges only applied to humans? Does this environment have any effect on the spacecraft? How does it compare to their home environment? How about the other environments that have been discussed on Earth? (Note: this section learning could be used to take notes to help in the creation of a space habitat, be it in space or on another planet. Again if you had time to do this preconference activity.)

During the conference a video from NASA Engineers that work to resolve some of the issues and challenges of living in a space habitat will be viewed. Many photographs and video material to support students' questions and analysis will be offered. An understanding of space environment and planetary differences will be elaborated including long-duration effects of living in space on humans.

IV. Q&A

V. Good-Bye

During Video Conference Materials

MATERIALS LIST: No materials really needed but paper and a pencil for notes.

Post-Conference Feedback

We value your input! By providing us with feedback, you help continue improving our programs and help them remain free of cost to educators across the country. Please provide feedback to: **david.a.mazza@nasa.gov**

National Aeronautics and Space Administration

NASA Digital Learning Network

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Certificate of Completion

to

_____

for

Habitats, Managing them in Space

NASA Digital Learning Network

Instructor

_____

Date

Resources and Opportunities

Please use the web resources listed below to enhance your understanding of space habitats, NASA's resources and opportunities.

Vocabulary:

Atmosphere: an envelope of gas surrounding a planet or moon.

Atrophy: a wasting away of the body or of an organ or part, as from disuse. An astronaut's muscles can atrophy after time in space so they must exercise.

Cosmic radiation: high-energy radiation that is emitted from the sun to all directions in space. The eight-month trip to Mars for example will expose astronauts to a much higher dose of cosmic radiation than that found on Earth.

Countermeasure: a measure or action taken to counter or offset another one. Astronauts exercise as a countermeasure against bone loss.

Demineralization: the loss, deprivation, or removal of minerals or mineral salts from the body, especially through disease, as the loss of calcium from bones or teeth.

Distill: to heat a liquid to make it a gas and then to cool the gas back to a liquid so that it is pure. One way to minimize the amount of water that has to be carried on a space mission is to distill waste water and fluids back into drinking water.

Fluid: a substance, as a liquid or gas, that is capable of flowing. Ordinary methods of dealing with fluids, such a pouring, will not work in space.

In Situ: Future space exploration or terraforming may rely on obtaining supplies in situ, such as previous plans to power the Orion space vehicle with fuel minable on the moon. The Mars Direct mission concept is based primarily on the in situ fuel production using Sabatier reaction.

In the space sciences, in situ refers to measurements of the particle and field environment that the satellite is embedded in, such as the detection of energetic particles in the solar wind, or magnetic field measurements from a magnetometer.

Microgravity: in the freefall of orbit, a person experiences a slight gravitational attraction to the earth called microgravity, although the overall sensation is that of being weightless.

Nutrition: the science or study that deals with food and nourishment, especially in humans. Good nutrition is important in an astronaut's food choice to maintain health and prevent bone loss in space.

Orbit: to move or travel around a central object in an orbital or elliptical path. Earth orbits the Sun once every 365.25 days. Mars orbits the Sun every 687 days.

Physiology: the branch of biology dealing with the functions and activities of living organisms and their parts, including all physical and chemical processes. One of the major activities on the space station is to study the changes in physiology brought on by living in a near-weightless environment so we can plan for the long duration space missions.

Recycle: to treat or process used or waste materials so as to make suitable for reuse. Astronauts recycle water to minimize the amount that must be carried into space and stored.

Terraforming: To transform (a landscape) on another planet into one having the characteristics of landscapes on Earth. Latin terra, *earth*;

Weightless: the condition of being in a continual freefall during orbit so that all sense of gravitational attraction is lost. Astronauts need some time to get used to being weightless in space. They are able to move and install very large parts of the space station because these parts, which weigh several tons on earth, are weightless in space.

Resources:

Visit http://solarsystem.nasa.gov/planets/ and review the solar system and learn about the environments of space and the planets.
Visit http://www.nasa.gov/exploration/technology/deep_space_habitat/ and learn what NASA research on expanding human presence into the solar system.
Visit http://www.nasa.gov/mission_pages/station/main/index.html to view updates on the International Space Station (ISS). The ISS is a football field sized habitat orbiting the Earth with up to 6 occupants.

Space Habitats
Content in this section supports the understanding of ecosystems involving living organisms and the nonliving physical environment. Find references about habitats designed to support life on long-duration space travel.
http://www.nasa.gov/audience/foreducators/spacelife/topics/habitats/index.html

Expanding Earth
Expanding Humans presence in the Solar System
http://www.nasa.gov/exploration/technology/deep_space_habitat/

Opportunities

Post conference Habitat Design
Classroom time permitting the students may enhance their design of their Earth Habitat with the supplies, materials, and environmental statistic, or diagram a space habitat based on the discussions during the event. These designs could be part of the post conference activity and then sent to the module presenter for review. They can note the differences from the pre-conference design to their final design. If the designs are completed the teacher may photograph the design and send it you the module presenter for consideration to be posted on our DLN website. The e-mail address of the presenter will be included in the post conference thank you letter.